6450-

DEPARTMENT OF ENERGY

10 CFR Part 430

[EERE–2021–BT–STD–0011]

RIN 1904-AE99

Energy Conservation Program: Energy Conservation Standards for Consumer Products; Early Assessment Review; Ceiling Fans

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy.

ACTION: Request for information.

SUMMARY: The U.S. Department of Energy ("DOE") is undertaking an early assessment review for amended energy conservation standards for ceiling fans to determine whether to amend applicable energy conservation standards for this product. Specifically, through this request for information ("RFI"), DOE seeks data and information to evaluate whether amended energy conservation standards would result in significant savings of energy; be technologically feasible; and be economically justified. DOE welcomes written comments from the public on any subject within the scope of this document (including those topics not specifically raised in this RFI), as well as the submission of data and other relevant information concerning this early assessment review.

DATES: Written comments and information are requested and will be accepted on or before **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

ADDRESSES: Interested persons are encouraged to submit comments using the Federal eRulemaking Portal at *http://www.regulations.gov*. Follow the instructions for submitting comments. Alternatively, interested persons may submit comments, by email to the following address: CeilingFans2021STD0011@ee.doe.gov. Include "Ceiling Fans

Early Assessment Energy Conservation Standard RFI" and docket number EERE-2021-BT-STD-0011 and/or RIN number 1904-AE99 in the subject line of the message. Submit electronic comments in WordPerfect, Microsoft Word, PDF, or ASCII file format, and avoid the use of special character or any form of encryption.

Although DOE has routinely accepted public comment submissions through a variety of mechanisms, including postal mail and hand delivery/courier, the Department has found it necessary to make temporary modifications to the comment submission process in light of the ongoing Covid-19 pandemic. DOE is currently accepting only electronic submissions at this time. If a commenter finds that this change poses an undue hardship, please contact Appliance Standards Program staff at (202) 586-1445 to discuss the need for alternative arrangements. Once the Covid-19 pandemic health emergency is resolved, DOE anticipates resuming all of its regular options for public comment submission, including postal mail and hand delivery/courier.

No telefacsimilies (faxes) will be accepted. For detailed instructions on submitting comments and additional information on this process, see section III of this document.

Docket: The docket for this activity, which includes *Federal Register* notices, comments, and other supporting documents/materials, is available for review at *http://www.regulations.gov*. All documents in the docket are listed in the *http://www.regulations.gov* index. However, some documents listed in the index, such as those containing information that is exempt from public disclosure, may not be publicly available.

The docket webpage can be found at: *http://www.regulations.gov/#!docketDetail;D=EERE-2021-BT-STD-0011*. The docket webpage contains instructions on how to access all documents, including public

comments, in the docket. See section III for information on how to submit comments through *http://www.regulations.gov*.

FOR FURTHER INFORMATION CONTACT:

Mr. Jeremy Dommu, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Office, EE-5B, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 586-9870. E-mail: *ApplianceStandardsQuestions@ee.doe.gov*.

Ms. Amelia Whiting, U.S. Department of Energy, Office of the General Counsel, GC-33, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 586-2588. E-mail: *amelia.whiting@hq.doe.gov*.

For further information on how to submit a comment or review other public comments and the docket, contact the Appliance and Equipment Standards Program staff at (202) 287-1445 or by e-mail: *ApplianceStandardsQuestions@ee.doe.gov*.

SUPPLEMENTARY INFORMATION:

Table of Contents

I. Introduction

DOE has established an early assessment review process to conduct a more focused analysis to evaluate, based on statutory criteria, whether a new or amended energy conservation standard is warranted. Based on the information received in response to the RFI and DOE's own analysis, DOE will determine whether to proceed with a rulemaking for a new or amended energy conservation standard. If DOE makes an initial determination that a new or amended energy conservation standard would satisfy the applicable statutory criteria or DOE's analysis is inconclusive, DOE would undertake the preliminary stages of a rulemaking to issue a new or amended energy conservation standard. If DOE makes an initial determination based upon available evidence that a new or amended energy conservation standard would not meet the applicable statutory criteria, DOE would engage in notice and comment rulemaking before issuing a final determination that new or amended energy conservation standards are not warranted.

A. Authority

The Energy Policy and Conservation Act, as amended ("EPCA"),[1] among other things, authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment. (42 U.S.C. 6291-6317) Title III, Part B[2] of EPCA established the Energy Conservation Program for Consumer Products Other Than Automobiles. These products include ceiling fans, the subject of this document. (42 U.S.C. 6291(49); 42 U.S.C. 6293(b)(16)(A)(i) and (B); and 42 U.S.C. 6295(ff))

Under EPCA, DOE's energy conservation program consists essentially of four parts: (1) testing, (2) labeling, (3) Federal energy conservation standards, and (4) certification and enforcement procedures. Relevant provisions of EPCA include definitions (42 U.S.C. 6291), test procedures (42 U.S.C. 6293), labeling provisions (42 U.S.C. 6294), energy conservation standards (42 U.S.C. 6295), and the authority to require information and reports from manufacturers (42 U.S.C. 6296).

Federal energy efficiency requirements for covered products established under EPCA generally supersede State laws and regulations concerning energy conservation testing, labeling, and standards. (42 U.S.C. 6297(a)–(c)) DOE may, however, grant waivers of Federal preemption in limited instances for particular State laws or regulations, in accordance with the procedures and other provisions set forth under 42 U.S.C. 6297(d).

DOE must follow specific statutory criteria for prescribing new or amended standards for covered products. EPCA requires that any new or amended energy conservation standard prescribed by the Secretary of Energy ("Secretary") be designed to achieve the maximum improvement in energy or water efficiency that is technologically feasible and economically justified. (42 U.S.C. 6295(o)(2)(A)) The Secretary may not

---

[1] All references to EPCA in this document refer to the statute as amended through the Energy Act of 2020, Public Law 116-260 (Dec. 27, 2020).
[2] For editorial reasons, upon codification in the U.S. Code, Part B was redesignated Part A.

prescribe an amended or new standard that will not result in significant conservation of energy, or is not technologically feasible or economically justified. (42 U.S.C. 6295(o)(3))

EPCA also requires that, not later than 6 years after the issuance of any final rule establishing or amending a standard, DOE evaluate the energy conservation standards for each type of covered product, including those at issue here, and publish either a notification of determination that the standards do not need to be amended, or a NOPR that includes new proposed energy conservation standards (proceeding to a final rule, as appropriate). (42 U.S.C. 6295(m)(1)) DOE is publishing this RFI in accordance with the 6-year lookback requirement.

B. Rulemaking History

In a final rule published on October 18, 2005, DOE codified design standards prescribed by EPCA for ceiling fans. 70 FR 60407, 60413. These standards are set forth in DOE's regulations at title 10 of the Code of Federal Regulations ("CFR") section 430.32(s), and require all ceiling fans manufactured on or after January 1, 2007, to have (1) fan speed controls separate from any lighting controls; (2) adjustable speed controls (either more than one speed or variable speed); and (3) the capability for reverse action (other than fans sold for industrial or outdoor application or where safety would be an issue)). (42 U.S.C. 6295(ff)(1)(A))

In a final rule published January 19, 2017, DOE established energy conservation standards for ceiling fans, which are expressed as the minimum allowable efficiency in terms of cubic feet per minute per watt ("CFM/W"), as a function of ceiling fan diameter in inches. These standards were to apply to all covered ceiling manufactured in, or imported into, the United States on and after January 21, 2020. 82 FR 6826, 6827 ("January 2017 Final Rule").

The Energy Act of 2020 (Public Law 116-260), which was signed into law on December 27, 2020, amended performance standards for large-diameter ceiling fans.[3] (42 U.S.C. 6295(ff)(6)(C)(i), as codified) Pursuant to the Energy Act of 2020, large-diameter ceiling fans are subject to standards in terms of the Ceiling Fan Efficiency Index ("CFEI") metric, with one standard based on operation of the fan at high speed and a second standard based on operation of the fan at 40 percent speed or the nearest speed that is not less than 40 percent speed. (42 U.S.C. 6295(ff)(6)(C)(i), as codified)

The current energy conservation standards are located in 10 CFR 430.32(s). The currently applicable DOE test procedures for ceiling fans appear at 10 CFR part 430, subpart B, appendix U, Uniform Test Method for Measuring the Energy Consumption of Ceiling Fans ("Appendix U"). Sampling and certification requirements for ceiling fans are set forth at 10 CFR 429.32.

II. Request for Information

DOE is publishing this RFI to collect data and information during the early assessment review to inform its decision, consistent with its obligations under EPCA, as to whether the Department should proceed with an energy conservation standards rulemaking. Below DOE has identified certain topics for which information and data are requested to assist in the evaluation of the potential for amended energy conservation standards. DOE also welcomes comments on other issues relevant to its early assessment that may not specifically be identified in this document.

A. Scope

EPCA defines a "ceiling fan" as "a nonportable device that is suspended from a ceiling for circulating air via the rotation of fan blades." (42 U.S.C. 6291(49)) DOE has established seven product classes for ceiling fans: highly decorative, belt-driven, very

---

[3] A large-diameter ceiling fan is a ceiling fan that is greater than seven feet in diameter. 10 CFR part 430 subpart B appendix U section 1.14.

small-diameter, hugger, standard, high-speed small-diameter, and large-diameter fans. 82 FR 6826, 6836 Belt-driven and highly decorative ceiling fans are not presently subject to performance standards. 10 CFR 430.32(s)(2)(ii)(C) and (E). DOE also has not established performance standards for centrifugal ceiling fans, oscillating ceiling fans, or ceiling fans whose blades' plane of rotation cannot be within 45 degrees of horizontal fans. 10 CFR 430.32(s)(2)(ii)(A), (B), and (D). The five product classes subject to performance standards are delineated by fan diameter, blade thickness, and blade-to-ceiling distance. Those product classes are: high-speed small-diameter ("HSSD"), hugger, large-diameter ("LDCF"), standard, and very-small-diameter ("VSD") as defined in 10 CFR part 430, subpart B, appendix U.

Issue 1: DOE requests comment and data that would allow DOE to evaluate whether energy conservation standards would be technically feasible and economically justified for belt-driven ceiling fans. Specifically, DOE requests comment on the number of models of belt-driven ceiling fans available, the number of shipments, and the technology options that might be incorporated to improve energy efficiency.

Issue 2: DOE seeks information regarding any other new product classes it should consider for inclusion in its analysis. DOE also requests relevant data detailing the corresponding impacts on energy use that would justify separate product classes (i.e., explanation for why the presence of these performance-related features would increase or decrease energy consumption).

B. Significant Savings of Energy

In the January 2017 Final Rule, DOE established an energy conservation standard for ceiling fans that is expected to result in 2.01 quadrillion British thermal units ("quads") of full fuel cycle (FFC) energy savings over a 30-year period. 82 FR 6826, 6828. Additionally, in the January 2017 Final Rule, DOE estimated that an energy

conservation standard established at an energy use level equivalent to that achieved using the maximum available technology ("max-tech") relative to the selected energy use level would have resulted in 1.73 additional quads of FFC energy savings.[4] 82 FR 6826, 6874.

While DOE's request for information is not limited to the following issues, DOE is particularly interested in comment, information, and data on the following topics to inform whether potential amended energy conservation standards would result in a significant savings of energy.

1. Energy Use Analysis

As part of the rulemaking process, DOE conducts an energy use analysis to identify how products are used by consumers, and thereby determine the energy savings potential of energy efficiency improvements. DOE bases the energy consumption of ceiling fans on their rated power usage as determined by the DOE test procedure and as provided from the engineering analysis. The energy use analysis is meant to represent typical energy consumption in the field.

For the January 2017 Final Rule, DOE combined the ceiling fan power ratings from the engineering analysis with estimates of the distribution of annual operating hours in field operating conditions. DOE assumed that all standard, hugger, and VSD ceiling fans with brushless direct current ("DC") motors and 7 percent of those fans with alternating current ("AC") motors (which were estimated to have a remote control) have standby power consumption. For such ceiling fans, DOE assumed a power usage of 0.7 watts and that all hours of the year not in active mode were in standby mode. 82 FR 6826, 6846.

---

[4] DOE determined this amount by subtracting the FFC energy from TSL 5 (max-tech) from the FFC energy from TSL 4 (current standard); 3.74 - 2.01 = 1.73 quads.

For HSSD and large-diameter ceiling fans, DOE assumed 12 hours per day, on average, of active mode operation. DOE assumed that HSSD ceiling fans spend approximately 10 percent of the time at high and 10 percent at low speeds, with the remaining 80 percent of the time spent at medium speed. 82 FR 6826, 6847. For LDCFs, DOE assumed an equal proportion of time spent at each of the speeds tested according to the DOE test procedure for ceiling fans. 81 FR 48619, 48632-48633. As with standard, hugger, and VSD ceiling fans, DOE estimated hours of operation in standby mode for HSSD and LDCFs as the number of hours not spent in active mode. DOE assumed HSSD ceiling fans with DC motors had standby power consumption of 0.7 watts. For LDCFs, DOE assumed a standby power consumption of 7 watts, regardless of motor type. 82 FR 6826, 6847. For details on the energy use analysis, see chapter 7 of the January 2017 Final Rule Technical Support Document ("2017 CF ECS TSD").[5]

Issue 3: DOE requests comment and data on the assumptions used in the January 2017 Final Rule regarding the daily operating hours and the proportion of time spent at each speed setting for ceiling fans, specifically HSSD and LDCFs.

Issue 4: DOE requests data and feedback on the fraction of standard, hugger, and VSD ceiling fans with remote controls, and therefore standby power consumption.

Issue 5: DOE requests comment on whether any of the smart technologies available on the market would impact the efficiency of ceiling fans as measured by DOE's test procedure at 10 CFR part 430, subpart B, appendix U. Specifically, DOE seeks comment on whether smart technologies

---

[5] The 2017 CF ECS TSD can be found here: *https://www.regulations.gov/document?D=EERE-2012-BT-STD-0045-0149*

improve the efficiency of ceiling fans or impact the number of operating hours in each mode. DOE additionally requests data regarding the comparative energy use of fans with and without smart technology.

2. Shipments

DOE develops shipments forecasts of ceiling fans to calculate the national impacts of potential amended energy conservation standards on energy consumption, net present value ("NPV"), and future manufacturer cash flows. DOE shipments projections are based on available historical data broken out by product class and efficiency. Current sales estimates allow for a more accurate model that captures recent trends in the market.

For the January 2017 Final Rule, DOE relied on various sources for estimating historical shipments data for ceiling fans. For standard, hugger, and VSD ceiling fans, DOE used data from Appliance magazine's Statistical Review from 1991-2006, data from ENERGY STAR Annual Reports from 2003-2013, and data purchased from NPD Research group from 2007-2011. DOE disaggregated shipments between standard, hugger, and VSD product classes based on the relative fraction of model counts found online and in-store and feedback from manufacturers. DOE was unable to find historical shipments data for HSSD and LDCFs; therefore, DOE primarily relied on manufacturer feedback and available model counts online to estimate shipments. 82 FR 6826, 6853. For details on the shipments methodology used in the previous rulemaking, see chapter 9 of the 2017 CF ECS TSD. Table II.1 shows estimated annual shipments by product class from 2016 to 2020.

Table II.1 Annual Shipments for Ceiling Fans (Thousand Units)

Year	Standard	Hugger	VSD	HSSD	LDCF
2016	9,718	9,216	76	540	11
2017	10,015	9,499	78	554	12

2018	10,232	9,704	80	564	14
2019	10,296	9,765	81	571	15
2020	10,258	9,729	82	542	15

Issue 6: DOE requests historical ceiling fan shipments data for each product class listed in section II.A and seeks feedback on how the annual shipments estimates shown in Table II.1 compare to the actual shipments in those years. If disaggregated shipments data are not available at the product class level, DOE requests shipments data at any broader available category (e.g., residential vs. commercial and industrial sectors).

C. Technological Feasibility

During the January 2017 Final Rule, DOE considered a number of technologies for reducing ceiling fan energy consumption. 82 FR 6826, 6837-6838. DOE is interested in understanding any technology improvements relative to ceiling fans since the previous energy standards rulemaking. Additionally, DOE is interested in any changes to the technologies it evaluated in preparation for the January 2017 Final Rule that may affect whether DOE could propose a "no-new-standards" determination, such as an insignificant increase in the range of efficiencies and performance characteristics of these technology options. DOE also seeks comment on whether there are any other technology options that DOE should consider in its analysis.

While DOE's request for information is not limited to the following issues, DOE is particularly interested in comment, information, and data on the following.

1. Technology Options

In analyzing the feasibility of potential new or amended energy conservation standards, DOE uses information about existing and past technology options and prototype designs to help identify technologies that manufacturers could use to meet and/or exceed a given set of energy conservation standards under consideration. A complete list of the options considered in the January 2017 Final Rule appears in Table II.2. Table II.3 lists additional technology options that DOE may consider in a future ceiling fan energy conservation standards rulemaking that were not considered in the January 2017 Final Rule.

Table II.2 Technology Options for Ceiling Fans Considered in the Development of the January 2017 Final Rule

Technology Option	Description
Fan optimization	This represents increasing the efficiency of a fan by adjusting existing fan design features. These adjustments could include changing blade pitch, fine-tuning motor RPM, and/or changing internal motor characteristics.
More Efficient Motors:	
Larger direct drive single-phase induction motors	This represents increasing the mass and/or choosing steel with better energy efficiency characteristics for the stator and rotor stack, improving the lamination design, increasing the cross section and/or length of the copper wiring inside the motor.
Three-phase induction motors	Three-phase induction motors have lower thermal energy losses than typical single-phase motors typically found in residential line-power applications. They also have a more even torque on the rotor resulting in a more efficient rotation and less motor "hum." In residential applications, an electronic drive would be necessary to convert single-phase power into three-phase.
Brushless DC Motor	In residential applications, brushless DC motors typically consist of a permanent magnet synchronous AC motor that is driven by a multi-pole electronic drive system. Similar to DC motors, brushless DC motors typically achieve better efficiency that standard AC motors because they have no rotor energy losses.
Geared Brushless DC motor in LDCFs	Fans with brushless DC geared motors have fan blades attached to the motor via a geared mechanism.
Gearless Brushless DC motor in LDCFs	A brushless DC motor drives the fan blades directly without the use of a geared mechanism, avoiding drive efficiency losses associated with the gearbox.

Premium AC motor in LDCFs	Premium AC motors are NEMA Premium® motors that are highly energy efficient electric motors. A motor can be marketed as a NEMA Premium motor if it meets or exceeds a set of minimum full-load efficiency levels.[6] Such NEMA motors are available in integral horsepower capacities (*i.e.*, 1 hp+)
More Efficient Blades:	
Curved Blades	Curved blades are blades for which the centerline of the blade cross section is cambered. Curved blades generally have uniform thickness and no significant internal volume.
Airfoil Blades	Airfoil blades use curved surfaces to improve aerodynamics, but the thickness is not uniform, and the top and bottom surfaces do not follow the same path from leading edge to trailing edge. Airfoil blades typically do not operate as efficiently in reverse, potentially impacting consumer utility on models where reverse flow was an option.
Twisted Blades	Twisted blades reduce aerodynamic drag and improve efficiency by decreasing the blade pitch or twist from where the blade attaches to the motor casing to the blade tip
Blade attachments	Blade attachments refer to upswept blade tips or other components that can be fastened to a fan blade to potentially increase airflow or reduce drag.
Beveled Blades	Beveled blades are typically beveled at the blade edges from the motor casing to the blade tip. Beveled fan blades are more aerodynamic than traditional fan blades.
Alternative Blade Materials	Use of alternative materials could enable more complex and efficient blade shapes (plywood vs MDF vs injection molded resin, for example).
Ceiling Fan Control Sensors:	
Occupancy Sensors	Occupancy sensors use technologies that detect the presence of people through movement, body heat, or other means. Ceiling fans with an occupancy sensor could power down if they sense that a room is unoccupied.
Wind and Temperature Sensors	Wind and temperature sensors detect temperature changes in the surrounding space, or potential wind speed reductions below certain thresholds. Ceiling fans could potentially adjust fan speed based on the wind and temperature in the space the ceiling fan is located when coupled with these sensors.

[6] NEMA Premium Motors Information Page:
https://www.nema.org/Policy/Energy/Efficiency/Pages/NEMA-Premium-Motors.aspx

Table II.3 Potential New Technology Options for Ceiling Fans

Technology Option	Description
Permanent Magnet DC Motor (Brushed DC Motors)	Permanent magnets are located on the motor stator with brushes contacting a commutator on the rotor. These are more efficient than AC motors but require more maintenance than AC motors since the brushes wear out.
Self-Balancing Systems	Some fans advertise a self-balancing system that prevents wobbling of the fan blades. The advertised benefits include reduction in noise and improvements in blade aerodynamics. An improvement in blade aerodynamics is generally expected to reduce energy fan consumption.

While DOE's compliance certification database does not currently have manufacturers report efficiency, DOE's market research, along with public databases like the California Energy Commissions ("CEC") Modern Appliance Efficiency Database System and the Energy Star Certified Ceiling Fans Database, indicate that many ceiling fans on the market exceed DOE's maximum-technologically ("max-tech") feasible designs presented in the January 2017 Final Rule.

Issue 7: DOE seeks information on the technologies listed in Table II.2 of this document regarding their applicability to the current market and how these technologies may impact the efficiency of ceiling fans as measured according to the DOE test procedure. DOE also seeks information on how these technologies may have changed since they were considered in the January 2017 Final Rule analysis. Specifically, DOE seeks information on the range of efficiencies or performance characteristics that are currently available for each technology option as well as the impact of each on availability of ceiling fan features or consumer utility.

Issue 8: DOE seeks information on the technologies listed in Table II.3 of this document regarding their market adoption, costs, and any concerns with

incorporating them into products (e.g., impacts on consumer utility, potential safety concerns, manufacturing/production/implementation issues, etc.). Further, DOE seeks comment on other technology options not listed in Table II.3 of this document that it should consider for inclusion in its analysis and if these technologies may impact product feature availability or consumer utility.

Issue 9: As DOE assesses the technologies listed in Table II.2 and Table II.3 of this document for LDCFs, DOE seeks information about the relationship between the CFM/W and the CFEI metric. Specifically, DOE requests comment about whether the technologies that improve the efficiency in terms of CFM/W also improve efficiency in terms of CFEI. Further, DOE seeks airflow and power usage data at high speed and at 40 percent speed (or the nearest speed that is not less than 40 percent speed) for LDCFs currently on the market.

Issue 10: DOE seeks feedback on what additional design options are incorporated in the commercially available products that exceed DOE's max-tech. Specifically, DOE requests comment on the fans present in the CEC Modern Appliance Efficiency Database System and the Energy Star Certified Ceiling Fans Database that exceed DOE's previous max-tech efficiency levels and whether this increase is due to new technology options that would represent a new max-tech model or a sacrifice of consumer utility.

Issue 11: DOE requests feedback on whether, and if so how, manufacturers would incorporate the technology options listed in Table II.2 and Table II.3 of this document to increase energy efficiency in ceiling fans beyond the baseline. This includes information on the order in which manufacturers

would incorporate the different technologies to incrementally improve the efficiencies of products from the baseline through the max-tech designs (and beyond max-tech designs where possible). As part of this request, DOE seeks information as to whether there are limitations on the use of certain combinations of design options. DOE also requests feedback on whether the increased energy efficiency would lead to other design changes that would not occur otherwise. DOE is also interested in information regarding any potential impact of design options on a manufacturer's ability to incorporate additional functions or attributes in response to consumer demand.

Issue 12: DOE requests comment on whether certain design options may not be applicable to (or are incompatible with) specific product classes.

2. Screening of Technology Options

The purpose of the screening analysis is to evaluate the technologies that improve equipment efficiency to determine which technologies will be eliminated from further consideration and which will be passed to the engineering analysis for further consideration. DOE determines whether to eliminate certain technology options from further consideration based on technological feasibility; practicability to manufacture, install, and service; adverse impacts on product utility or product availability; adverse impacts on health or safety; and unique-pathway proprietary technologies. 10 CFR part 430, subpart C, appendix A, 6(c)(3) and 7(b).

Technology options identified in the technology assessment are evaluated against these criteria using DOE analyses and inputs from interested parties (*e.g.*, manufacturers, trade organizations, and energy efficiency advocates). Technologies that pass through the screening analysis are referred to as "design options" in the engineering analysis.

Technology options that fail to meet one or more of the five criteria are eliminated from consideration.

Table II.4 summarizes the technology options that DOE screened out in the January 2017 Final Rule, and the applicable screening criteria. Most technologies were eliminated because of significant adverse impacts on the utility of the equipment to a considerable number of consumer subgroups. 82 FR 6826, 6837-6839. Three-phase induction motors were not considered as a design option for standard, hugger, VSD, and HSSD fans, primarily because three-phase power is extremely uncommon in residential applications. Large direct-drive single-phase induction motors were screened out for HSSD and LDCF because HSSD manufacturers indicated that HSSD ceiling fans already use the most efficient size of AC induction motors, while LDCF manufacturers stated that increasing the size of the motor in a LDCF will not improve energy efficiency. See chapter 4 of the 2017 CF ECS TSD.

Table II.4 Previously Screened Out Technology Options from the January 2017 Final Rule*

Screening Criteria (X = Basis for Screening Out)					
Screened Technology Option	Technological Feasibility	Practicability to Manufacture, Install, and Service	Adverse Impact on Product Utility	Adverse Impacts on Health and Safety	Unique-Pathway Proprietary Technologies
Three-phase induction motors (Standard, hugger, and HSSD ceiling fans)	X				
Beveled blades			X		
Twisted blades			X		
Blade attachments			X		
Alternative blade materials			X		
Occupancy, wind, and temperature sensors			X		
Single-phase direct-drive induction motors (Large diameter ceiling fans)	X				
*Affected equipment classes are listed in the parenthetical					

Issue 13: DOE requests feedback on what impact, if any, the five screening criteria described in this section would have on each of the technology options listed in Table II.2 and Table II.3 of this document with respect to ceiling fans. Similarly, DOE seeks information regarding how these same

criteria would affect any other technology options not already identified in this document with respect to their potential use in ceiling fans.

Issue 14: DOE requests comment on which technology options are specific to air flow, as measured by the DOE test procedure. DOE is interested in which technology options, if any, provide both consumer comfort and improved energy efficiency. As such, DOE also requests data on consumer buying patterns and whether or not consumers have specific requests regarding blade shape and material, fan hub size and shape, and other aspects of the design.

3. Representative Ceiling Fan Blade Span

Ceiling fans are sold with a range of diameters or blade spans. It is impractical to conduct a detailed engineering analysis on every possible blade span. As such, for the January 2017 Final Rule, DOE identified representative sizes for each ceiling fan product class to use as the basis for its engineering analysis. 82 FR 6826, 6852. The representative unit sizes evaluated to support the January 2017 Final Rule are presented in Table II.5.

Table II.5 Representative Ceiling Fan Diameters/Blade Spans used in the Development of the January 2017 Final Rule

Product Class	Representative Unit Sizes (Blade Span)
VSD	13-inch
	16-inch
Standard	44-inch
	52-inch
	60-inch
Hugger	44-inch
	52-inch
HSSD	36-inch
	56-inch
LDCF	8-foot
	12-foot
	20-foot

Issue 15: DOE requests feedback on whether the representative blade spans listed in Table II.5 of this document are representative for the respective ceiling fan product classes. If the blade spans listed in Table II.5 of this document are not representative for a given product class, DOE seeks data and supporting information on what blade spans are representative for each product class. Specifically, DOE is interested in information about any units that would have a significantly different cost-efficiency curve from the representative units. For example, if certain technology options are not feasible for a given blade span or would significantly increase costs for blade spans above or below the representative units.

4. Baseline Efficiency Levels

For each established product class, DOE selects a baseline model as a reference point against which any changes resulting from new or amended energy conservation standards can be measured. The baseline model in each product class represents the characteristics of common or typical products in that class. Typically, a baseline model is one that meets the current minimum energy conservation standards and provides basic consumer utility. Consistent with this analytical approach, DOE expects to consider the current minimum energy conservations standards (which went into effect on January 1, 2020) to establish the baseline efficiency levels for each product class. The current standards for each product class are based on CFM/W for small-diameter fans and on CFEI for LDCFs. The current standards for ceiling fans are found at 10 CFR 430.32(s).

Issue 16: DOE requests feedback on whether using the current established energy conservation standards for ceiling fans are appropriate baseline efficiency levels for DOE to apply to each product class in evaluating whether to amend the current energy conservation standards for these

products. If the current energy conservation efficiency levels are not appropriate for use as baseline efficiency levels, DOE requests proposals for alternate baseline efficiency levels, supported by appropriate market and technical data.

Issue 17: DOE requests feedback on the appropriate baseline efficiency levels for any potential product classes that are not currently in place or for any contemplated combined product classes, as discussed in section II.A of this document. For potential new product classes, DOE requests energy use data to characterize the baseline efficiency level.

5. Standby Energy Consumption Metric

As stated, LDCFs are no longer subject to the minimum efficiency requirements in terms of the CFM/W metric as established in the January 2017 Final Rule, (42 U.S.C. 6295(ff)(6)(C)(i)(I), as codified) instead, LDCFs are subject to standards in terms of the CFEI metric. (42 U.S.C. 6295(ff)(6)(C)(i)(II), as codified) LDCFs are subject to two separate standards: one at operation of the fan at high speed and the other at operation of the fan at 40 percent speed or the nearest speed that is not less than 40 percent speed ("40 percent speed"). *Id.* CFEI is calculated according to ANSI/AMCA 208-18, which in turn references ANSI/AMCA 230-15, the industry test standard for circulating fans (which is already incorporated by reference as the test standard for testing LDCFs in Appendix U). (42 U.S.C. 6295(ff)(6)(C)(ii), as codified)

The previously applicable CFM/W metric incorporates active mode at multiple speeds, standby mode, and off mode into a single metric. Since CFEI does not capture standby mode or off mode, DOE may need to develop a separate standby mode metric for

LDCFs. The test procedure for measuring standby power consumption is specified in Appendix U.

Issue 18: As discussed in section B.1 of this RFI, the 2017 CF ECS Final Rule assumed 7 watts for standby operation of LDCFs. DOE requests data on standby power consumption for LDCFs. DOE further requests comment on any technology options that increase or decrease standby energy consumption. Finally, DOE requests comment on any impacts a standby energy consumption standard might have on operation and function of a LDCF.

D. Economic Justification

In determining whether a proposed energy conservation standard is economically justified, DOE analyzes, among other things, the potential economic impact on consumers, manufacturers, and the Nation. As discussed in more detail below, DOE is interested in whether there are economic barriers to the adoption of more-stringent energy conservation standards and if there are any other aspects of its economic justification analysis from the January 2017 Final Rule that may indicate whether a more-stringent energy conservation standard would be economically justified or cost effective.

1. Cost Analysis

For the January 2017 Final Rule, DOE used a combination of physical and catalog teardowns for the cost assessment to build "bottom up" manufacturing cost assessments of different models of ceiling fans. 82 FR 6826, 6841-6842; see chapter 5 of the 2017 CF ECS TSD. DOE initially identified a representative sample of baseline efficiency models and more efficient models that incorporate design options DOE was considering. DOE then utilized physical and catalog teardowns to generate a bill of materials for the

baseline efficiency models. DOE relied on technology pairs, where a similarly constructed ceiling fan incorporates a new technology option that allows it to achieve greater efficiency, to evaluate the cost increase associated with technology options that increase efficiency. See section 5.2 of the 2017 CF ECS TSD.

DOE is aware that features are available for ceiling fans that may not have been as widely available at the time of the last energy conservation standards analysis. One such example could be the increased prevalence of "smart" ceiling fans that have wireless connectivity. These fans may have new components that impact the overall cost of the fan.

Issue 19: DOE requests comment on whether there have been substantial changes in the ceiling fan market that would impact the results of the cost analysis. Specifically, DOE is interested in whether and how the costs estimated for design options in the January 2017 Final Rule have changed since the time of that analysis due to the increased use of components such as remotes and sensors for smart phone connection.

2. Markups Analysis

DOE derives consumer prices by applying markups to the MSP. In deriving markups, DOE determines the major distribution channels for product sales, the markup associated with each party in each distribution channel, and the existence and magnitude of differences between markups for baseline products ("baseline markups") and higher-efficiency products ("incremental markups"). The identified distribution channels (*i.e.*, how the products are distributed from the manufacturer to the consumer), and estimated relative sales volumes through each channel are used in generating end-user price inputs

for the life-cycle cost ("LCC") and payback period ("PBP") analyses and the national impact analysis.

In the January 2017 Final Rule, DOE considered two major categories of ceiling fans to derive their distribution channels. The first category, corresponding mainly to the residential sector, was comprised of standard, hugger and VSD ceiling fans. The other category included LDCFs and HSSD ceilings fans, which are typically installed in commercial and industrial applications. For standard, hugger and VSD ceiling fans, DOE identified four distribution channels and estimated their market shares for 2019 based on manufacturer interviews, as shown in Table II.6. For the commercial and industrial sectors, DOE considered a distribution channel in which the consumer receives the product from the manufacturer through an external dealer/conventional dealer or an in-house manufacturer dealer.[7] 82 FR 6826, 6845. Furthermore, a review of the market indicates that consumers are increasingly purchasing ceiling fans through online channels, which DOE did not explicitly consider in the January 2017 Final Rule. DOE is therefore interested in the magnitude and impact of online sales to the ceiling fans markups analysis.

Table II.6 Distribution Channels for Standard, Hugger and VSD Ceiling Fans

Distribution Channel	**Market Share in 2019**
Manufacturer → Home Improvement Center → Consumer	12.9%
Manufacturer/Home Improvement Center (in-store label) → Consumer	61.6%
Manufacturer → Wholesaler → Contractor → Consumer	18.0%
Manufacturer → Showroom → Consumer	7.5%

[7] For both cases, DOE assumed the same markup for in-house dealers and external dealers.

Issue 20: DOE requests feedback on whether the distribution channels and underlying assumptions used in the January 2017 Final Rule are still applicable, as well as data to update its markups analysis for ceiling fans.

Issue 21: DOE requests data and feedback on the magnitude and impact of online sales to the ceiling fans distribution channels. DOE also seeks input on whether the markups for online sales are significantly different from ceiling fans sold through conventional distribution channels.

3. Life-Cycle Cost and Payback Period Analysis

DOE conducts the LCC and PBP analysis to evaluate the economic effects of potential energy conservation standards for ceiling fans on individual consumers. For any given efficiency level, DOE measures the PBP and the change in LCC relative to an estimated baseline level. The LCC is the total consumer expense over the life of the equipment, consisting of purchase, installation, and operating costs (expenses for energy use, maintenance, and repair). Inputs to the calculation of total installed cost include the cost of the equipment—which includes MSPs, distribution channel markups, and sales taxes—and installation costs. Inputs to the calculation of operating expenses include annual energy consumption, energy prices and price projections, repair and maintenance costs, equipment lifetimes, discount rates, and the year that compliance with new and amended standards is required.

a. DC Motor Market Share and Efficiency Trends

DOE measures savings of potential standards relative to a "no-new-standards" case that reflects conditions without new and/or amended standards and uses current efficiency market shares to characterize the "no-new-standards" case product efficiency distribution. By accounting for consumers who already purchase more efficient ceiling

fans, DOE avoids overstating the potential benefits from potential standards. Online ceiling fan data collection performed in support of the January 2017 Final Rule suggested that approximately 10 percent of standard and hugger ceiling fan models listed online in 2015 had DC motors. More recent data collection shows that approximately 14 percent of standard and hugger ceiling fan models listed online have DC motors, suggesting a trend toward DC motors. Since DC motors are generally more efficient than AC motors, standard and hugger ceiling fans with DC motors are expected to be more efficient than those with AC motors.

Issue 22: DOE requests feedback and data on the current market share of DC motor ceiling fans for each product class. DOE also requests feedback and data that would help characterize any shifts to higher efficiency technologies for each ceiling fan product class.

b. Installation Costs

In the January 2017 Final Rule, DOE assumed that installation costs were the same regardless of efficiency level for a given product class. 82 FR 6826, 6848. DOE is not aware of any data that suggest the cost of installation changes as a function of efficiency for ceiling fans. DOE therefore assumed that installation costs are the same regardless of efficiency level and do not impact the LCC or PBP. As a result, DOE did not include installation costs in the LCC and PBP analysis.

Issue 23: DOE requests feedback and data on whether any market or technology changes since the January 2017 Final Rule would indicate that installation costs vary by efficiency level. More specifically, DOE is interested in if and how installation costs are affected by ceiling fans with the specific technology options listed in Table II.2 and Table II.3 of this document.

c. Repair and Maintenance Costs

In the January 2017 Final Rule, DOE assumed that maintenance costs are the same for any given product class, regardless of efficiency level and therefore do not impact the LCC or PBP analyses. DOE included a purchaser repair cost for 6.5 percent of ceiling fans with brushless DC motors (primarily due to their electronic components) based on an estimate from a ceiling fan technical expert, and no repair cost for AC motor fans. 82 FR 6826, 6850. This 6.5 percent repair rate is incremental over the assumed repair rate of ceiling fans with AC motors. The repair cost was $1,000 for LDCFs and $150 for all other product classes. All repair costs were assessed at half of the product lifetime.

Issue 24: DOE requests information and data on the frequency of repair and repair costs by product class for the technology options listed in Table II.2 and Table II.3 of this document. DOE particularly requests information and data to inform the assumption from the January 2017 Final Rule that ceiling fans with DC motors require repair at a higher frequency than ceiling fans with AC motors. While DOE is interested in information regarding each of the listed technology options, DOE is also interested in whether consumers simply replace the products when they fail as opposed to repairing them.

d. Lifetimes

In the January 2017 Final Rule, DOE used historical shipments data and age distributions from installed stock data of standard and hugger ceiling fans to model ceiling fan lifetimes using a Weibull function having a mean of 13.8 years for all product classes. 82 FR 6826, 6851.

Issue 25: DOE requests feedback and data on the expected lifetimes of ceiling fans. In particular, DOE is interested in data that indicate if and how lifetimes differ by product class, as well as data on the expected lifetimes of VSD, HSSD, and large-diameter ceiling fans.

4. Net Present Value

To develop the national NPV from potential standards, DOE calculates annual energy expenditures and annual equipment expenditures for the no-new-standards case and the standards case. The discounted difference between energy bill savings and increased equipment expenditures in each year is the NPV.

For the January 2017 Final Rule, DOE applied a price decline trend for ceiling fans with brushless DC motors. Given the absence of historical price data and cumulative shipments for brushless DC motors, DOE assumed that it is the circuitry and electronic controls associated with brushless DC motors that would be affected by price trends driven by the larger electronics industry. As a result, DOE adopted an annual price decline rate of 6 percent applied to the incremental cost associated with a brushless DC motor (i.e., the cost difference between the ceiling fan with a brushless DC motor and the ceiling fan at the lower efficiency level). 82 FR 6826, 6854.

Issue 26: DOE requests feedback and any relevant data that could inform its price trend methodology for ceiling fans. Specifically, DOE is interested in data indicating how the price of ceiling fans with DC motors has changed since the January 2017 Final Rule.

III. Submission of Comments

DOE invites all interested parties to submit in writing by the date under the **DATES** heading, comments and information on matters addressed in this notification and on other matters relevant to DOE's early assessment of whether more-stringent energy conservation standards are not warranted for ceiling fans.

Submitting comments via http://www.regulations.gov. The *http://www.regulations.gov* webpage requires you to provide your name and contact information. Your contact information will be viewable to DOE Building Technologies staff only. Your contact information will not be publicly viewable except for your first and last names, organization name (if any), and submitter representative name (if any). If your comment is not processed properly because of technical difficulties, DOE will use this information to contact you. If DOE cannot read your comment due to technical difficulties and cannot contact you for clarification, DOE may not be able to consider your comment.

However, your contact information will be publicly viewable if you include it in the comment or in any documents attached to your comment. Any information that you do not want to be publicly viewable should not be included in your comment, nor in any document attached to your comment. If this instruction is followed, persons viewing comments will see only first and last names, organization names, correspondence containing comments, and any documents submitted with the comments.

Do not submit to *http://www.regulations.gov* information for which disclosure is restricted by statute, such as trade secrets and commercial or financial information (hereinafter referred to as Confidential Business Information (CBI)). Comments submitted through *http://www.regulations.gov* cannot be claimed as CBI. Comments

received through the website will waive any CBI claims for the information submitted. For information on submitting CBI, see the Confidential Business Information section.

DOE processes submissions made through *http://www.regulations.gov* before posting. Normally, comments will be posted within a few days of being submitted. However, if large volumes of comments are being processed simultaneously, your comment may not be viewable for up to several weeks. Please keep the comment tracking number that *http://www.regulations.gov* provides after you have successfully uploaded your comment.

Submitting comments via email. Comments and documents submitted via email also will be posted to *http://www.regulations.gov*. If you do not want your personal contact information to be publicly viewable, do not include it in your comment or any accompanying documents. Instead, provide your contact information in a cover letter. Include your first and last names, email address, telephone number, and optional mailing address. The cover letter will not be publicly viewable as long as it does not include any comments.

Include contact information each time you submit comments, data, documents, and other information to DOE. Faxes will not be accepted.

Comments, data, and other information submitted to DOE electronically should be provided in PDF (preferred), Microsoft Word or Excel, WordPerfect, or text (ASCII) file format. Provide documents that are not secured, written in English, and free of any defects or viruses. Documents should not contain special characters or any form of encryption and, if possible, they should carry the electronic signature of the author.

Campaign form letters. Please submit campaign form letters by the originating organization in batches of between 50 to 500 form letters per PDF or as one form letter with a list of supporters' names compiled into one or more PDFs. This reduces comment processing and posting time.

Confidential Business Information. Pursuant to 10 CFR 1004.11, any person submitting information that he or she believes to be confidential and exempt by law from public disclosure should submit via email two well-marked copies: one copy of the document marked "confidential" including all the information believed to be confidential, and one copy of the document marked "non-confidential" with the information believed to be confidential deleted. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

It is DOE's policy that all comments may be included in the public docket, without change and as received, including any personal information provided in the comments (except information deemed to be exempt from public disclosure).

DOE considers public participation to be a very important part of the process for developing test procedures and energy conservation standards. DOE actively encourages the participation and interaction of the public during the comment period in each stage of this process. Interactions with and between members of the public provide a balanced discussion of the issues and assist DOE in the process. Anyone who wishes to be added to the DOE mailing list to receive future notices and information about this process should contact Appliance and Equipment Standards Program staff at (202) 287-1445 or via e-mail at *ApplianceStandardsQuestions@ee.doe.gov*.

Signing Authority

This document of the Department of Energy was signed on May 2, 2021, by Kelly Speakes-Backman, Principal Deputy Assistant Secretary and Acting Assistant Secretary for Energy Efficiency and Renewable Energy, pursuant to delegated authority from the Secretary of Energy. That document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the *Federal Register*.

Signed in Washington, DC, on May 4, 2021.

Treena V. Garrett,

Federal Register Liaison Officer,

U.S. Department of Energy.

[FR Doc. 2021-09703 Filed: 5/6/2021 8:45 am; Publication Date: 5/7/2021]